DOCUMENT RESUME

ED 315 738 CS 009 944

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TITLE The Use of Visualizing in Comprehending Difficult Abstract Prose.
PUB DATE 85
NOTE 17p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Higher Education; *Reading Comprehension; *Reading Instruction; Reading Research; Reading Strategies; *Remedial Reading; *Visualization
IDENTIFIERS North Carolina; Writing Strategies

ABSTRACT

A study investigated the use of visualizing in remembering or understanding difficult abstract prose. Subjects, 40 students in two freshman developmental reading classes in a state college in North Carolina, received either instruction in drawing out images or in writing paraphrases as they read difficult material. Posttests of abstract reading comprehension indicated no significant increases in reading comprehension for either group nor significant differences between groups. Findings suggested that further research is warranted because of a higher number of unanswered questions on the posttest for the group that used visualizing. (One table of data is included.) (Author/RS)

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The Use of Visualizing in Comprehending Difficult Abstract Prose

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ABSTRACT

While recent research supports the use of visualizing in remembering or understanding written prose of a concrete nature, there is some theoretical and empirical basis for its application with abstract material. The purpose of this study was to investigate the use of visualizing in understanding difficult abstract prose. The subjects were 40 students in two freshmen developmental reading classes. After pretests of abstract reading comprehension, one group received instruction in drawing out images and the other group received instruction in writing paraphrases as they read difficult material. Posttests revealed no significant increases in reading comprehension for either group nor significant differences between groups. However, further research on this topic is warranted because of a higher number of unanswered questions on the posttest for the group that used visualizing.

The Use of Visualizing in Comprehending Difficult Abstract Prose

Much of the recent research on the use of visualizing in the comprehension of written prose has focused on the understanding or remembering of concrete reading materials. The use of visualizing in enabling readers to understand difficult abstract prose has received much less attention. The influential work of Alan Paivio (1966) suggests that this emphasis is appropriate. Paivio considers images and verbal processes to be alternative coding systems. According to this dual-coding model, images function more effectively with concrete stimuli or task requirements, and verbal processes function more effectively with abstract stimuli or task requirements. He bases this conclusion on experiments measuring subject responses to words and sentences which varied on the concreteness-abstractness dimension. He found, for instance, that imagery reaction times were directly related to the concreteness of noun stimuli. In another experiment Paivio found that subjects were more likely to identify semantic change with concrete sentences and lexical change with abstract sentences (Begg and Paivio, 1969). This finding supported Paivio's view that the comprehension of concrete sentences depends on the arousal of mental imagery, while the comprehension of abstract sentences is "tied to the verbal sequences themselves" (Paivio, 1971, p. 460).

However, the work of other theorists calls into question

Paivio's views about the relative usefulness of imagery and language in abstract tasks. Arnheim (1969) considers images to be the basic media of thought except for strictly logical thought which proceeds only to conclusions inherent in the definitions of words. He defines mental images as "remembered perceptions" that can range from the pictorially complete to flashes of shape or direction. Arnheim shows that images are not limited to concrete phenomena but that abstract concepts such as democracy or good and bad marriages can be visualized and portrayed in pictures drawn by students. According to Arnheim, words serve as indirect aids to thinking. Thought operations are accomplished using images derived from sensory perceptions. And words are tools for accessing and stabilizing these images.

Kaufmann (1979, 1980, 1985) also differs with Paivio's conclusions about the use of imagery. He argues that the use of imagery or verbal processes depends on the specific demands of the processing task and not only on a behavioral response elicited by a concrete or an abstract stimulus. According to Kaufmann, imagery at times increases in usefulness with increasingly abstract tasks "... in order to be able to tackle the task on a more concrete and manageable level for instance..." (Kaufmann, 1980, p. 43).

Kaufmann states that language is the most important symbolic process in thinking and that imagery is a subordinate

symbolic tool which "operates within and under the conceptual control of language" (Kaufmann, 1987, p. 117). Imagery, then, enhances the effectiveness of linguistic processing, and, because it can adopt to specific problem situations, is especially useful in tasks which have a high degree of novelty and which cannot be fully handled by the application of the general principles and rules accessible to language. Kaufmann bases this view on a series of experiments that showed that visual imagery was effective in representing the transformation of situation necessary in solving certain types of problems (Kaufmann, 1979).

Several recent empirical studies have examined the effectiveness of visualizing in the learning and recall of concrete materials using passages of a scientific or of a narrative nature. These studies generally give positive support for the use of visualizing in comprehending concrete materials. Those showing positive results include: Alesandrini (1981), Dansereau, et. al. (1979), and Gambrell and Bales (1987). Weak or non-significant results for imagery were shown by Alesandrini, Langstaff, and Wittrock (1983) and Sadowski (1983).

The study by Gambrell and Bales (1987) showed that mental imagery strategies can improve the comprehension monitoring process. Subjects who used mental imagery while reading narrative passages identified inconsistencies in the text

significantly more often than did a control group. This study while dealing with concrete materials also supported Kaufmann's view of imagery as an active information handling process that is effective in solving problems that present novel situations.

Rasco, Tennyson, and Boutwell (1975) investigated the effectiveness of imagery instructions and drawings in reading verbal information. They conducted three experiments using reading materials that dealt with commonly held misconceptions about revolutions with college and high school students and mathematical concepts with fourth and fifth grade students. They contrasted the performance of subjects on immediate recall tests in four reading conditions: receiving drawings and mental imagery instructions, receiving only mental imagery instructions, receiving only drawings, or receiving neither drawings nor mental imagery instructions.

They found that for the experiments with the college and elementary students there were significant results favoring the use of drawings and imagery instructions both together and separately over the condition of using neither drawings nor imagery instructions. The trend of the data with the high school students was consistent with these findings.

Due to the apparently abstract nature of the topics of reading in this series of experiments, one might infer that imaging is effective in understanding abstract material.

However, since the authors do not specifically describe the level of abstraction of the materials used, such an inference might be considered speculative.

The few empirical studies which explicitly examine the effect of imaging strategies on the comprehension of abstract prose do not support this strategy generally. Tirre, Manelis, and Leicht (1979) found that a verbal strategy produced better comprehension than an imaginal strategy when subjects studied concrete and abstract passages for college-level texts. Also, the authors found no interaction among the different strategies and the degree of concreteness of the passages. However, this study actually measured the effects of an imagery strategy on remembering not comprehending relationships among concepts in concrete and abstract materials. The imagery strategies were only applied after each passage had been read, and the comprehension tests were delayed for a two-day interval.

In a study by Geisen and Peeck (1984), subjects were instructed to form mental images as they read narrative materials. The authors manipulated the concrete-abstract variable by using test questions that focused on explicit concrete or abstract information. The results of the study indicated a significant difference in favor of the use of imagery by the experimental group when compared to a control group for explicit concrete, contradictory, and spatial

questions but not for abstract questions. Also, subjects using imagery were significantly less able to detect that the inference questions they missed were referring to information that was not in the text. The results of this study appear to agree with Paivio's and run counter to Kaufmann's views concerning the effectiveness of imagery in processing abstract information. However, one might question whether the experimental group actually employed the imagery strategy on the abstract material.

One way of insuring that subjects apply visualizing strategies to abstract material is to have them draw their images as they read the material. This strategy is employed in the present investigation. It is hypothesized that subjects will be better able to understand difficult abstract material if they attempt to represent the concepts in pictures. The pictures would serve to enable the readers to connect the abstract words with the readers' past experiences and would allow a systematic processing of the text similar to that involved in problem solving.

Method

Subjects

The subjects in this study were 40 students in two developmental reading classes in a state college in Western North Carolina. The students were placed in the classes on

the basis of Nelson-Denny Reading Test scores below the 11th grade level.

Materials

The materials used in this study were derived from the reading materials normally employed in the developmental reading classes.

Test Materials

Two equivalent forms of a test of abstract reading comprehension were developed using passages from Reading for Understanding 3, a reading kit appropriate for use with college students. The kit uses short passages, graduated in difficulty, and with multiple choice responses for completing the last sentences of the passages. The multiple choice options were omitted, and the test forms merely required the student to complete the passages by supplying words that completed the thought of the last sentence and were appropriate to the context of the passage. For example:

> There is no position that depends on clearer principles than that every act of a delegated authority, contrary to the tenor of the commission under which it is exercised, is void. No legislative act, therefore, contrary to the Constitution can be valid. To deny this would be to affirm that the deputy is greater than the principal; that the servant is above the master; that the representatives of the people are...

Twenty-four passage that consisted of abstract content were chosen from the most difficult levels of the kit and balanced according to difficulty and length in two forms (A and B) of 12 items each. Passages were judged abstract if they focused on a topic that did not refer to tangible physically perceivable objects or situations. For example, the suppression of opinion by authority was judged an abstract topic while a passage dealing with the human circulatory system was rejected as not being sufficiently abstract. Passages were also rejected if the abstract topics were explained or developed using tangible details. An independent expert reviewed the two forms of the test and concurred that all of the passages were abstract. The two forms of the test were given to a group of 30 students enrolled in a required study skills course. Alternate form reliability was computed as .57. Adequate answers were developed for each test item, and upon completion the tests were graded randomly and anonymously by two graders. Inter-grader reliability was .90.

Practice Materials

Practice materials were brief passages from The Harper and Row Reader (Booth and Gregory, 1984) which consisted of quotes from noted persons on the themes of a liberal education, the individual and society, and perspectives on the world. The passages allowed the subjects to practice their

reading techniques on progressively longer, more difficult, and more abstract materials.

Procedure

The two classes were assigned randomly to one of two treatment conditions: visualizing instruction or writing instruction. Both groups received a pretest of abstract reading comprehension followed by a two weeks instructional period and then a posttest.

Time was controlled on the pretest and posttest at 40 minutes. For the pretest, the subjects in both conditions were instructed to read each passage carefully and write words that completed the thought of the last sentence and that were appropriate to the context of the passage. If they finished early they were instructed to review their work until the time was up.

After the pretest, students in the visualizing treatment condition received an instructional program in drawing mental images as an aid to comprehending prose passages. The students in the writing condition received instruction in using writing as an aid to reading comprehension.

The visualizing technique consisted of the subjects reading through the passage and then rereading it and drawing images that represented meaningful chunks of information. Abstract concepts were represented by drawing objects

associated with the concept, concrete examples of the concept, or by symbolic figures which represented essential features of the concept. Additionally students were instructed to portray the relationships among concepts by using lines or arrows to connect their images as in concept mapping.

In the writing technique, the subjects were instructed to read through the passage and then to write out the ideas in each meaningful chunk of the passage, using their own words as much as possible. Five 50-minute class sessions were spent on learning and practicing the visualizing and writing methodologies.

At the conclusion of the training program, the posttest of abstract reading comprehension was administered to both groups. The subjects in the visualizing treatment condition were instructed to apply the visualizing technique, actually drawing out their images of the passage on scratch paper before completing the final sentences. The subjects in the writing condition were instructed to apply the writing technique by writing out the meaning of each passage on scratch paper before completing the final sentences.

Results

A t-test comparing the differences in the performances of the two groups was conducted. The hypothesis that the visualizing strategy would improve the comprehension of abstract materials was not confirmed. As the data in the

Table shows, students who used visualizing techniques did not improve significantly differently from students who used the writing techniques. Nor were the posttest scores for either group significantly different from the pretest scores.

Table 1

Comparison of Pretest and Posttest Abstract Reasoning Scores for the Visualizing and Writing Groups

Group	N	T_1	T_2	T_2-T_1	S.D.	S.E.
Visualizing	19	5.42	5.58	0.16	2.41	0.55
Writing	21	5.71	5.24	-0.47	2.60	0.57

Results of independent t-test for the differences in the change of scores (T_2-T_1) between the groups: t=0.80; p=0.43

Results of dependent t-test for the differences between the pretests and posttests (T_2-T_1) within each group:

Visualizing -- t = 0.29, p. = 0.78
Writing -- t = -0.84, p. = 0.41

Discussion

This study investigated the effects of a visualizing technique on the comprehension of abstract prose. No significant differences were observed between the improvement of the performance of subjects trained in visualizing compared to subjects trained in a writing strategy. There were also no significant differences between the pretest and posttest

performances of the subjects in either of the two groups. These results indicate that neither of the treatment conditions increase subjects' comprehension of abstract prose more than reading and rereading the passages in the given amount of time.

Time was an apparent factor in the results. While the subjects generally had sufficient time to complete the pretest, several students in each group did not finish the posttests. For both groups a total of 19 questions were left unanswered on the pretest and 82 unanswered on the posttest. This high omission rate on the posttest, however, may be due to insufficient time only in part. Some other factor such as an increased awareness by the subjects that they did not understand the passages may also have been operating.

This possibility points out a problem with the design of this study. As Gambrell and Bales (1986) demonstrated, one of the benefits of the mental imaging is to heighten metacognitive awareness. But in this study, students had no way of taking advantage of an increased self monitoring of comprehension. Perhaps access to a glossary or dictionary during the tests would have given them an opportunity for this.

Further research on the effect of visualizing in comprehending abstract prose is warranted. This study should be redesigned to insure sufficient time to apply the

strategies effectively and to allow students to capitalize on increased metacognitive awareness that may result from the visualizing techniques.

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